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RESEARCH NOTE

CURRENT SERIAL RECORDS

CENTRAL STATES FOREST EXPERIMENT STATION

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USE AIR-DRY DECKBOARDS FOR BETTER WOODEN PALLETS

Any practice that will reduce failures in reusable wooden pallets will increase their life, lower the cost of using them, and help to preserve this important market for low-grade hardwood lumber. A study in progress^{1/} at the Carbon-dale, Illinois field office of the Central States Forest Experiment Station indicates that using dry lumber for pallet deckboards might do just that.

Ninety pallets were made from three combinations of green and air-dry (12 to 14 percent moisture content) red oak lumber as follows:

- 30 pallets--all parts from green lumber.
- 30 pallets--all parts from dry lumber.
- 30 pallets--deckboards from dry lumber,
stringers from green lumber.

The pallets were 40- by 48-inch, two-way entry, double-face, nonreversible, flush-stringer pallets built according to recommendations of the National Wooden Pallet Manufacturers Association^{2/} and the U.S. Forest Products Laboratory.^{3/} All pallets were similar except for the original moisture content of the component parts. Edge deckboards 5 1/2 to 5 3/4 inches wide were nailed to each stringer with three 2 1/2-inch, diamond-point, spiral-grooved pallet nails.^{4/}

^{1/} This is a continuing study. Results described here are for the first year.

^{2/} National Wooden Pallet Manufacturers Association. Minimum standard specifications for warehouse, permanent or returnable wooden pallets. 1954.

^{3/} Heebink, T. B., and Fobes, E. W. Hardwood pallet manufacturing. U.S. Forest Prod. Lab. Rpt. 2132, 32 pp., illus. 1958.

^{4/} The Screw-Tite pallet nails used for this study were provided by the Independent Nail Corporation, Bridgewater, Massachusetts.

In accordance with common commercial practice, dry deckboards and dry stringers were predrilled but green pallet parts were not.

The 90 pallets are being used in the apple-processing plant of Eckert Orchards, Incorporated, Carbondale, Illinois. During the first year of the test, the plant operated intermittently for a total of 165 days and the pallets were moved an average of 0.6 times per day. Six pallets were accidentally damaged when rammed by lift-truck forks. Breakage in these pallets was confined to top edge deckboards and, in two cases, to an adjacent top deckboard (fig. 1). These pallets were repaired and placed back in service.

Excluding the accidental damage, ten pallets failed during normal use. Eight of these were all-green pallets, one was an all-dry pallet, and the other was a dry-green pallet. Failures consisted of complete separation of a top edge deckboard from one or more stringers due to nails either pulling through the deckboard or shearing off (fig. 2). In no case did a nail pull out of a stringer.

Failures resulted primarily from the prying action of lift-truck forks and appeared to be closely related to splits or through-checks at the nails. There were four times as many splits or through-checks at the nails in green deckboards as in dry deckboards.

When the edge deckboard was split or checked at the nails, the nails most often bent or pulled through the deckboard. If the deckboard was not split or checked, the nails usually sheared off between the stringer and the deckboard. The type of nail failure also depended on the location of nails in edge deckboards: nails closest to the leading or front edge of the deckboard most often pulled through, while those nearest the trailing or back edge of the deckboard usually sheared off (fig. 2). Failure of nails at the center of the 5 1/2-inch-wide edge deckboards was about equally divided between pull-through and shearing. It appeared that when splits were present at the nails in edge deckboards, the prying action of the lift-truck forks caused the leading edge nails to begin pulling through the deckboard. The resulting increased load on the trailing edge nails tended to shear them off. Since splits were more prevalent in green deckboards, this failure happened most often in pallets fabricated with green decks.



Figure 1.--A typical accidental ramming failure.



Figure 2.--A typical normal use failure.

Nail-popping (protrusion of nail heads due to shrinking of stringers) was prevalent in both groups of pallets that were fabricated with green stringers. Most nail-popping was slight, but some fiberboard apple boxes were torn or gouged by protruding nail heads.

A comparison of failures in the test pallets during the first year of use indicates that the advantages of using air-dry lumber for deckboards might well offset the added initial cost of pallets with dry decks. Except for minor nail-popping, there was no noticeable difference in pallet performance due to initial moisture content of stringers, but this factor might become important with further use. Pallets with loose deckboards were repaired and returned to service. We will continue to observe and record performance through at least one more season of use.

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